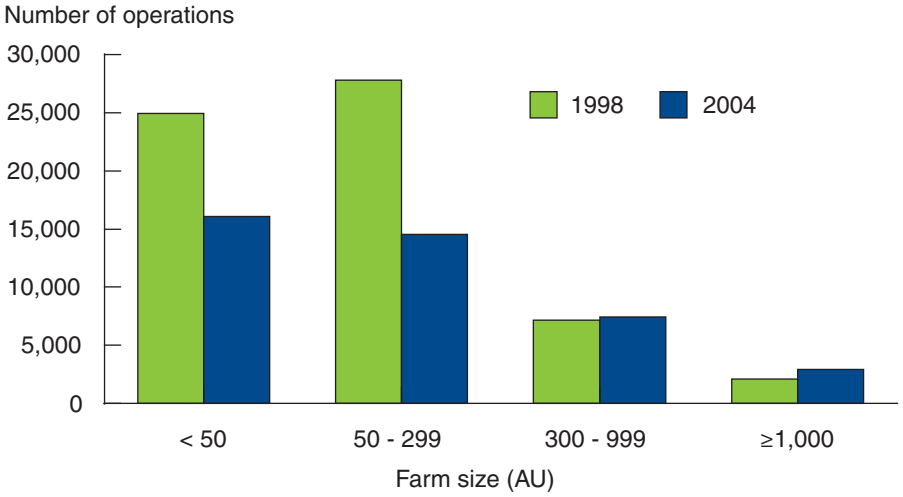
Structural Change and Manure Management

Changes in manure management practices partly reflect changes in the scale and methods of hog production. Between 1998 and 2004, there was a rapid decline in the number of hog operations producing fewer than 300 animal units (fig. 1), resulting in a shift in production to larger operations (fig. 2). Over this period, the total number of hog operations fell by about 40 percent, and the average inventory grew from 2,589 to 4,646 head per farm (table 1).

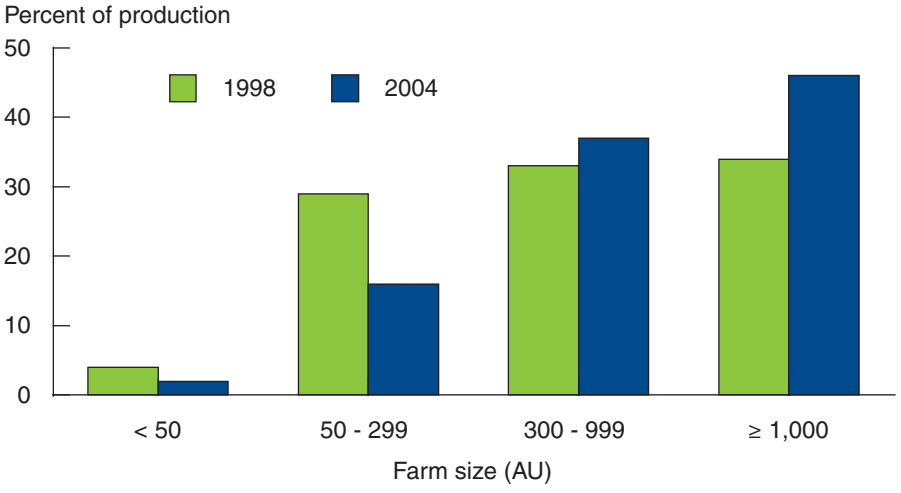
Changes in the scale of production have been accompanied by changes in how production is organized. Hog farms that handle all phases of production have given way to operations increasingly specialized in a single phase.

Figure 1
Small hog operations declined in number and large ones grew between 1998 and 2004



Source: USDA, ERS, 1998 and 2004 Agricultural Resource Management Surveys.

Figure 2
Large operations produced a greater share of output in 2004



Source: USDA, ERS, 1998 and 2004 Agricultural Resource Management Surveys.

Table 1
Summary statistics, 1998 and 2004

	1998	2004
All hog farms		
Observations in sample	1,633	1,198
Number of farms in population	61,971	40,940
Hog sales and contract removals (head per farm)	2,589	4,646
Average hog inventory (animal units per farm)	194	294
Producer type: Farrow-to-finish (% of farms)	49	31
Producer type: Feeder pig-to-finish (% of farms)	31	40
Used a production contract (% of farms)	15	28

Note: A farm is defined as an operation having 25 or more hogs at any time during the year, and includes independent hog producers and growers who produce hogs under contract. Animal units are defined as 1,000 pounds of live animal weight, and the inventory of animal units is based on an estimate of the average number of hogs and pigs on the operation in each year. Farrow-to-finish operations are those on which pigs are farrowed and then finished to a slaughter weight of 225-300 pounds. Feeder pig-to-finish operations are those on which feeder pigs are obtained from outside the operation, either purchased or placed under contract, and then finished to a slaughter weight of 225-300 pounds.

Source: USDA, ERS, 1998 and 2004 Agricultural Resource Management Surveys.

The traditional approach of farrow-to-finish production accounted for about half of hog operations in 1998 but only about a third in 2004. Feeder-to-finish operations that specialize in the growing-finishing phase of production increased their share of market hogs sold/removed from 55 percent in 1998 to 77 percent in 2004 (Key and McBride, 2007). Changes in the scale and specialization of production have caused crop and hog production to concentrate more often on different farms and have created concerns about what to do with the growing concentration of manure on larger hog operations.

Changes in production scale and specialization have been made possible, in part, by the substantial growth of contract production. Production contracts govern the relationship between hog growers (contractees) and hog owners (contractors) and specify compensation for the inputs provided by each party. Such arrangements allow individual producers to specialize in one phase of production and increase their scale of operations. Over the 6 years between surveys, the share of farms using a production contract almost doubled (Key and McBride, 2007). One concern with production contract arrangements is who has liability for managing the hog manure. Most contracts have required growers to comply with all State, Federal, and local regulations in operating their facilities, while failure to comply can result in contract termination (Ogishi et al., 2003). Since contract growers are heavily invested in facilities, they are highly motivated to avoid liability.

Geographical shifts in hog production have accompanied the structural and organizational changes in the industry. Historically, hog production was concentrated in the Heartland, mainly Iowa and Illinois, where an abundant supply of corn provided a cheap source of hog feed and sufficient acreage on which to spread hog manure. During the 1980s and 1990s, hog production grew dramatically in the Southeast, especially in North Carolina, driven mainly by the growth of large contract operations. Growth in the Southeast has posed the challenge of how to manage an increasing volume of hog manure in areas with a more dense population and much less crop acreage for manure application than in the Heartland.[1] Since 1992, hog production also

[1] In research that underlies the discussion in this section, Key and McBride (2007) define the Heartland to include the States of IA, IL, IN, KY, MO, and OH, and the Southeast to include AL, AR, GA, NC, SC, and VA. These definitions apply throughout this report.

has moved aggressively into Western States like Colorado and Utah, where a low population density provides flexibility in managing animal manure.

More recently, the size of feeder pig-to-finish farms in the Heartland grew rapidly—doubling in average size between 1998 and 2004—while those in the Southeast grew more slowly (though starting from a larger average size). As a result, the Heartland's share of feeder pig-to-finish production grew 10 percentage points, while the Southeast's share declined by 7 points (Key and McBride, 2007). Slower growth in the Southeast can be attributed in part to a moratorium placed on the construction of new and expanded hog operations in 1997 (North Carolina General Assembly, 1997).[2] The moratorium was enacted in response to environmental concerns about managing hog manure from increasingly larger operations.

Structural change has coincided with substantial efficiency gains for hog farms, particularly on specialized hog-finishing operations. Most of these productivity gains were attributable to increases in the scale of production (scale efficiency) and technological innovation. The amount of feed used per unit of output declined by 24 percent between 1998 and 2004 on feeder-to-finish operations, while their real, or inflation-adjusted, production costs per hundredweight of gain also declined by 24 percent (Key and McBride, 2007, p. 14). Higher feed productivity can reduce the amount of manure produced by hog operations and thus the amount of manure nutrients that must be disposed.

[2] The North Carolina State legislature passed the Clean Water Responsibility and Environmentally Sound Policy Act in 1997. This law imposed a moratorium on the construction of new or expansion of existing hog operations with 250 or more head. Exceptions to the moratorium included construction using "innovative animal waste management systems that do not employ an anaerobic lagoon." North Carolina extended the moratorium several times before passing legislation in 2007 that strictly regulates manure management systems.